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PATENT APPLICATION AF#2800

ATTORNEY DOCKET NO. 10991682-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Sorin et al.

Serial No.: 09/488,149 **Examiner:** Wang, George

Filing Date: 01/20/2000 **Group Art Unit:** 2878

Title: SYSTEM AND METHOD FOR OPTICAL HETERODYNE DETECTION OF AN OPTICAL SIGNAL THAT UTILIZES OPTICAL ATTENUATION

ASSISTANT COMMISSIONER FOR PATENTS
Washington, D.C. 20231

TRANSMITTAL OF APPEAL BRIEF

Sir:

Transmitted herewith in triplicate is the Appeal Brief in this application with respect to the Notice of Appeal filed on **12/17/2002**.

The fee for filing this Appeal Brief is (37 CFR 1.17(c)) $320.00.

(complete (a) or (b) as applicable)

The proceedings herein are for a patent application and the provisions of 37 CFR 1.136(a) apply.

( ) (a) Applicant petitions for an extension of time under 37 CFR 1.136 (fees: 37 CFR 1.17(a)-(d) for the total number of months checked below:

( )	one month	$110.00
( )	two months	$410.00
( )	three months	$930.00
( )	four months	$1450.00

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( ) The extension fee has already been filled in this application.

(X) (b) Applicant believes that no extension of term is required. However, this conditional petition is being made to provide for the possibility that applicant has inadvertently overlooked the need for a petition and fee for extension of time.

Please charge to Deposit Account 50-1078 the sum of **$320.00**. At any time during the pendency of this application, please charge any fees required or credit any overpayment to Deposit Account 50-1078 pursuant to 37 CFR 1.25.

(X) A duplicate copy of this transmittal letter is enclosed.

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I hereby certify that this paper is being facsimile transmitted to the Patent and Trademark Office on the date shown below.
( ) Date of Facsimile:

Typed Name: **Mark A. Wilson**
Signature: Mark A. Wilson

Respectfully submitted,

Sorin et al.

By Mark A. Wilson

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Attorney Docket No. 10991682-1 PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appellant: Sorin et al. Group Art Unit: 2878

Serial No. 09/488,149 Examiner: Wang, George

Filed: January 20, 2000

For: SYSTEM AND METHOD FOR OPTICAL HETERODYNE DETECTION OF AN OPTICAL SIGNAL THAT UTILIZES OPTICAL ATTENUATION

Assistant Commissioner for Patents
Washington, D.C. 20231

BRIEF ON APPEAL

Sir:

This brief is in furtherance of Applicants' Notice of Appeal filed December 17, 2002, appealing the decision of the Examiner dated November 6, 2002 finally rejecting claims 1 – 20. A copy of the claims appears in the Appendix to this brief. This brief is transmitted in triplicate.

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I hereby certify that this paper (along with any paper referred to as being attached or enclosed) is being deposited with the United States Postal Service on the date shown below with sufficient postage as "U.S. Express Mail" in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231

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I. Real Party in Interest

The real party in interest in this appeal is Agilent Technologies, Inc., a Delaware Corporation, having a place of business at 395 Page Mill Road, Palo Alto, California 94303.

II. Related Appeals and Interferencs

There are currently no related appeals or interference proceedings in progress that will directly affect, or be directly affected by, or have a bearing on the Board's decision in the present Appeal.

III. Status of Claims

Claims 1 – 4, 11, 12, 14, and 15 were rejected under 35 U.S.C. 103(a) as being unpatentable over Sorin (U.S. Patent No. 5,365,335, referred to hereinafter as "Sorin") in view of Iwaoka et al. (U.S. Patent No. 4,856,899, referred to hereinafter as "Iwaoka").

Claims 1 – 20 were originally filed with the application. No claims have been amended, canceled, or added. This Appeal is made with regard to pending claims 1 – 20.

IV. Status of Amendments

There are no pending amendments.

V. Summary of the Invention

The claimed invention involves methods and systems for characterizing an optical signal utilizing optical heterodyne detection. The methods and systems, as recited in independent claims 1, 11, and 14, involve attenuating an input signal, combining the attenuated input signal with a local oscillator signal and detecting the combined optical signal. The input signal is attenuated before being combined with the local oscillator signal in order to improve the signal to noise ratio of the

heterodyne signal that is generated when the combined optical signal is detected. The signal to noise ratio of the heterodyne signal improves with attenuation of the input signal, specifically in the case where the intensity noise from the input signal is the dominant noise source, because the heterodyne signal and the intensity noise of the input signal scale differently with attenuation of the input signal.

A method for monitoring an optical signal utilizing optical heterodyne detection, as recited in claim 1, includes providing an input signal and a local oscillator signal and attenuating the input signal. The attenuated input signal is combined with the local oscillator signal to create a combined optical signal. The combined optical signal is detected and an output signal that is indicative of an optical parameter of the input signal is generated. In an embodiment of the method, the level of attenuation of the input signal is adjusted to maximize the signal to noise ratio of the heterodyne signal.

Another method for monitoring an optical signal utilizing optical heterodyne detection, as recited in claim 11, includes providing an input signal and a local oscillator signal and attenuating the input signal before the input signal and the local oscillator signal are combined. The attenuated input signal is then combined with the local oscillator signal to create a combined optical signal. The combined optical signal includes a heterodyne signal, intensity noise from the input signal, and shot noise. An electrical signal is generated in response to the combined optical signal. An output signal that is indicative of an optical parameter of the input signal is generated from the electrical signal. Additionally, the level of attenuation of the input signal is adjusted to maximize the signal to noise ratio of the heterodyne signal.

An embodiment of an optical heterodyne detection system, as recited in claim 14, includes an attenuator (224), an optical coupler (210), and a receiver (212). The attenuator has an input to receive an input signal (202) and an output for outputting an attenuated input signal. The optical coupler has a first input that is optically connected to the attenuator to receive the attenuated input signal and a second input that receives a local oscillator signal (206). The optical coupler combines the attenuated input signal and the local oscillator signal to create a combined optical signal and outputs the combined optical signal through an output. The optical receiver receives the combined optical signal from the optical coupler and generates an electrical signal that is representative of the combined optical signal.

An embodiment of the optical heterodyne detection system also includes a processor (216) that utilizes the electrical signal from the receiver (212) to generate an output signal that is indicative of an optical parameter of the input signal (202). The processor monitors the heterodyne signal that is a component of the combined optical signal in order to generate the output signal.

In an embodiment of the optical heterodyne detection system, the attenuator (224) is adjustable so that the input signal can be attenuated to different levels. Preferably, the attenuator is adjusted to attenuate the input signal to a level that maximizes the signal to noise ratio of the heterodyne signal. In an embodiment, the signal to noise ratio is maximized when the intensity noise of input signal is approximately equal to the shot noise of the local oscillator signal. A feedback loop (226) may be provided between the processor and the adjustable attenuator so that the attenuator can be adjusted in response to real-time measurements of the signal to noise ratio of the heterodyne signal.

Before utilizing the system to measure an input signal it may be necessary to calibrate the system. The attenuator may be utilized to block transmission of the input signal so that the optical coupler and the receiver can be calibrated.

VI. Issues

Whether claims 1 – 4, 11, 12, 14, and 15 are obvious under 35 U.S.C. 103(a) as being unpatentable over Sorin in view of Iwaoka.

VII. Grouping of Claims for Each Contested Ground of Rejection

Regarding the rejection under 35 U.S.C. 103(a) of Sorin in view of Iwaoka, claims 1 – 3, 11, 14, and 15 stand or fall together and claims 4 and 12 stand or fall together. Reasons why claims 4 and 12 are believed to be separately patentable are explained in the Argument section.

VIII. Argument

Applicants maintain that the Examiner has failed to make a *prima facie* case of obviousness under 35 U.S.C. 103(a) which requires that three basic criteria must be met, as set forth in M.P.E.P 2142:

> "First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all of the claim limitations."

The initial burden is therefore on the Examiner to establish a *prima facie* case of obviousness under 35 U.S.C. 103(a).

Applicants assert that claims 1 – 4, 11, 12, 14, and 15 are not rendered obvious from Sorin in view of Iwaoka because a *prima facie* case of obviousness has not been established. Applicants assert that a *prima facie* case of obviousness has not been established because the Examiner has not presented some suggestion or motivation, either in the references themselves, or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings. In addition, with regard to claims 4 and 12, Applicants assert that even if the prior art references were combined, the combined references fail to teach or suggest all of the claim limitations.

Background on Sorin and Iwaoka

Sorin discloses a "low-coherence reflectometer for use in measuring backscattering." (Abstract) That is, Sorin discloses a reflectometer that is used to measure the optical properties (specifically, the reflective properties) of a device. The device, whose optical properties are being measured by the reflectometer, is often referred to as the device under test or "DUT".

The reflectometer disclosed by Sorin in Fig. 3 includes a light source (214), a coupler (216), a device under test (12), an attenuator (240), mirrors (224 and 231), a detector (227), and an analyzer (219). The purpose of the attenuator in the reflectometer disclosed by Sorin is to attenuate the reference signal. According to

Sorin, the reference signal is attenuated because the power of the reference signal returned via fiber (223), in many cases of interest, is too large in comparison to the signal from the device under test (12) (the backscattered light). (col. 4, lines 39 – 48) As stated in Sorin at col. 5, lines 16 – 18, "according to the present invention, the reference power is decreased by including an attenuator in the reference *and* of the interferometer." (Applicants assume that the word "and" was a translation error and that the word should be read as "end")

Iwaoka discloses a heterodyne detection system for measuring an optical frequency spectrum. The system includes an amplifier (Fig. 5, 2a) for amplifying the input signal before the input signal is combined with a local oscillator signal from the local oscillator source (Fig. 5, 3a). As stated by the Examiner, the amplifier is provided to "increase the amplitude of the heterodyne signal."

<u>Basis of Rejection for Obviousness</u>

The Examiner states that Sorin discloses an input signal, a local oscillator signal, a coupler, an attenuator, and a detector as recited in claims 1, 11, and 14. The Examiner goes on to state that although Sorin discloses an attenuator, "Sorin fails to disclose an attenuator positioned before heterodyne signal combination" (Final action, November 6, 2002, page 3, item 2) but that in view of Iwaoka it would have been obvious "to have positioned the attenuator immediately after the input port and before the signal combination <u>as suggested by the placement of Iwaoka's amplifier</u> since the noise intensity from the input signal is usually a dominant noise source (fig. 5, ref. 2a)." (Office action page 3, item 3) From this statement, Applicants assume that the Examiner is suggesting that it would have been obvious to change the position of the attenuator (240), as disclosed in Fig. 3 of Sorin, from fiber (223) to fiber (213) such that the attenuator is located between the light source (214) and the coupler (216).

<u>The Amplifier in Iwaoka does not suggest or motivate moving the location of the attenuator in Sorin</u>

The Examiner states that "[i]t would have been obvious ... to have positioned the attenuator immediately after the input port and before the signal combination *as suggested by the placement of Iwaoka's amplifier* since the noise intensity from the input signal is usually a dominant noise source." [emphasis added] That is, the

Examiner's logic for combining the teaching of Iwaoka with Sorin is that the position of the amplifier in Iwaoka suggests a similar position for an attenuator in the reflectometer of Sorin. Applicants respectfully disagree that the position of the amplifier in Iwaoka suggests a similar position for the attenuator in the reflectometer of Sorin. Firstly, attenuating an optical signal involves decreasing the amplitude of an optical signal while amplifying an optical signal involves increasing the amplitude of an optical signal. Applicants assert that amplifying an optical signal does not suggest or motivate attenuating an optical signal. Secondly, Iwaoka discloses nothing about an attenuator or attenuating an optical signal. Rather, all Iwaoka discloses is an amplifier that is positioned such that it can amplify an input signal. Applicants assert that the amplifier in Iwaoka does not suggest or motivate that the attenuator in the reflectometer in Sorin could be moved from fiber (223) to fiber (213) in order to attenuate the input signal as concluded by the Examiner. Further, Applicants assert that amplification of an optical signal teaches away from attenuating a similarly situated optical signal. Applicants are not sure what is meant by the phrase "since the noise intensity from the input signal is usually a dominant noise source." Applicants assert that identifying intensity noise that is contributed from an input signal as a dominant noise source in a heterodyne detection system does not suggest or motivate the use of attenuation on an input signal as recited in claims 1, 11, and 14. Because the position of the amplifier in Iwaoka does not suggest or motivate a similar position for an attenuator in the reflectometer of Sorin, Applicants assert that the logic provided by the Examiner does not meet the threshold for a *prima facie* case of obviousness.

The Examiner also states that it would have been obvious to place an attenuator at a dominant site of noise generation because "[a]ttenuators are widely known in the art and are widely used to reduce noise levels, maximizing signal to noise ratio in several optical systems." (Final action, page 3, item 2) Applicants assert that just because an attenuator can be used to reduce noise levels and maximize signal to noise ratio "in several optical system," does not suggest that attenuation be used as recited in claims 1, 11, and 14. As disclosed in Sorin, attenuation can be used at different locations within an optical system to improve signal to noise ratio. The location and use of attenuation within an optical system may differ depending on the specifics of the system. The mere fact that references can be modified does not render the resultant combination obvious unless the prior art also suggests the desirability of

the combination. [M.P.E.P. 2143.01] Applicants assert that the general statement that attenuators are "widely known in the art" does not suggest that attenuation be used as recited in claims 1, 11, and 14 without some objective reasons.

There is no suggestion or motivation in Sorin to re-locate the attenuator

In addition to the assertion that Iwaoka does not provide the requisite suggestion or motivation, Applicants assert that the requisite suggestion or motivation to re-locate the attenuator in Sorin is not found in Sorin. As described above, the attenuator in Sorin is placed in a specific location for the specific, and stated, purpose of reducing the power of the reference signal because the power of the reference signal is too large in comparison to the signal from the device under test. Nowhere in Sorin is there a suggestion or motivation to move the attenuator to a different location. In particular, Sorin does not suggest that the attenuator should be positioned between the source (214) and the coupler (216) of Sorin.

In the "Response to Arguments" presented in the Final action dated November 6, 2002, the Examiner states that "the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2k 413, 208 USPQ 871 (CCPA 1981)." Applicants assert that this rule applies to situations where an applicant has argued that prior art devices are not physically combinable as recited in M.P.E.P. 2145, Section III. Applicants have never argued that the prior art devices of Sorin and Iwaoka are not physically combinable and therefore Applicants assert that this citation is not relevant to this case.

The proposed modification to Sorin would render the teachings of Sorin unsatisfactory for their intended purpose

Again, Applicants assume from the Examiner's statement, "[i]t would have been obvious … to have positioned the attenuator of Sorin immediately after the input port and before the signal combination" (Final action page 3, item 2), that the Examiner is suggesting that it would have been obvious to change the position of the attenuator (240), as disclosed in Sorin, from fiber (223) to fiber (213). As stated

above, the attenuator (240) in Fig. 3 of Sorin is located on the reference arm of the reflectometer in order to attenuate the reference signal because the power of the reference signal "is too large in comparison to the signal from device (12)." (col. 4, lines 46 – 47) That is, Sorin teaches that the purpose of the attenuator is to lower the power of the reference signal relative to the signal from the device under test (i.e., lower the ratio of reference signal power to the DUT signal power).

Applicants assert that modifying the reflectometer of Sorin by changing the position of the attenuator from fiber (223) to fiber (213), as proposed by the Examiner, would render the teachings of Sorin unsatisfactory for their intended purpose. It is well settled in the law that if the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. [MPEP 2143.01] Applicants assert that modifying the reflectometer of Sorin by moving the attenuator to fiber (213), as proposed by the Examiner, would render the teachings of Sorin unsatisfactory for their intended purpose <u>because changing the position of the attenuator to fiber (213) would not significantly lower the power of the reference signal relative to the signal from the device under test</u>. Applicants assert that changing the position of the attenuator to fiber (213) would cause the initial signal to be attenuated and <u>would simply lower the power of the reference signal (returned via fiber 223) and the signal from the device under test (returned via fiber 216) by equivalent amounts</u>. Lowering the power of the reference signal and the signal from the device under test by equivalent amounts does not significantly change the ratio of the two signal powers when combined at the coupler (216) and therefor does not cause any improvement in the signal to noise ratio of the desired signal. Because the ratio of the two signal powers is not significantly changed by moving the position of the attenuator as proposed by the Examiner, Applicants assert that the modified reflectometer would not achieve a stated objective of providing a reflectometer with the complexity of a Michelson interferometer but improved signal to noise performance (col. 2, lines 11 – 19). As a result, the proposed modification to Sorin would render the system unsatisfactory for its intended purpose. Applicants assert that because modifying the reflectometer of Sorin by moving the attenuator would render the modified reflectometer unsatisfactory for its intended purpose, there is no suggestion or motivation to modify the reflectometer as stated by the Examiner and therefore claims 1, 11, and 14 are not rendered obvious from Sorin in view of Iwaoka.

The Examiner also states that "whether the attenuator itself is placed immediately following the input signal or after the coupler, the attenuator serves the same purpose, exhibiting functional equivalency. Furthermore, it is held that the rearranging of parts of an invention involves only routine skill in the art. *In re Japikse*, 86 USPQ 70." Applicants assert that because modifying the reflectometer of Sorin as suggested by the Examiner would render the reflectometer unsatisfactory for its intended purpose, moving the attenuators involves more than simply a rearrangement of parts. That is, an attenuator in the reflectometer of Sorin does not serve the same purpose whether it is placed immediately following the input signal or after the coupler and therefore, moving the attenuator is not simply a rearrangement of parts as stated by the Examiner.

<u>Sorin does not teach or suggest adjusting the level of attenuation in response to feedback from an output signal</u>

Claims 4 and 12 recite a method and system in which *the level of attenuation is adjusted in response to feedback from an output signal.* Applicants assert that Sorin does not teach or suggest adjusting the level of attenuation in response to feedback from an output signal. Sorin discloses attenuators in the embodiments depicted in Figs. 3 and 5. However, the attenuators (240; 340) disclosed in Sorin are not connected to any feedback loop that receives feedback from an output signal. Additionally, Sorin does not disclose a process in which the level of attenuation is adjusted in response to feedback from an output signal. Because the attenuators are not connected to any feedback loop and because Sorin does not teach or suggest adjusting the level of attenuation in response to feedback from an output signal, Applicants assert that claims 4 and 12 are not rendered obvious in view of Sorin.

Applicants note that Sorin does disclose an additional photodetector and a subtraction circuit (Fig. 5, 344 and 346) that are used "to detect the RIN and subtract it from the measured signal." Sorin discloses that the subtraction is done when the RIN is very large and it is not "possible to sufficiently attenuate the reference signal sufficiently [to] make the RIN less than the shot noise without causing the signal to be dominated by the noise from the detector." (col. 5, lines 54 – 64). In particular, Sorin discloses measuring the light intensity from photodetector (344) and then subtracting the measured light intensity from the output of photodetector (327) via subtraction circuit (346). (col. 6, lines 7 – 10). However, Applicants assert that subtracting the

output from two photodetectors using the subtraction circuit (346) does not teach or suggest adjusting the level of attenuation in response to feedback from an output signal as recited in claims 4 and 12. Because Sorin does not teach or suggest adjusting the level of attenuation in response to feedback from an output signal, Applicants assert that claims 4 and 12 are not rendered obvious in view of Sorin.

SUMMARY

Applicants assert that because there is no suggestion or motivation in Sorin or Iwaoka or in the knowledge generally available to one of ordinary skill in the art to modify Sorin to include the teachings of Iwaoka and because Sorin would not work for its intended purpose if modified as suggest by the Examiner that a *prima facie* case of obviousness has not been made and claims 1, 11, and 14 are not rendered obvious from Sorin in view of Iwaoka.

For all the foregoing reasons, it is earnestly and respectfully requested that the Board of Patent Appeals and Interferences reverse the rejections of the Examiner regarding claims 1 – 20, so that this case may be allowed and pass to issue in a timely manner.

Respectfully submitted,

Date: February 18, 2003

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APPENDIX

1. A method for monitoring an optical signal utilizing optical heterodyne detection comprising steps of:

providing an input signal;

providing a local oscillator signal;

attenuating said input signal;

combining said attenuated input signal with said local oscillator signal to create a combined optical signal;

detecting said combined optical signal; and

generating an output signal that is indicative of an optical parameter of said input signal.

2. The method of claim 1 wherein said step of generating an output signal includes monitoring a heterodyne signal that is a component of said combined optical signal.

3. The method of claim 2 wherein said step of attenuating said input signal includes a step of attenuating said input signal to a level of attenuation that maximizes the signal to noise ratio of said heterodyne signal.

4. The method of claim 3 further including a step of adjusting said level of attenuation in response to feedback from said output signal in order to maximize said signal to noise ratio.

5. The method of claim 4 further including steps of measuring intensity noise of said input signal before said input signal is combined with said local oscillator signal, comparing said measured intensity noise of said input signal to the sum of all other noise sources related to said combined optical signal, and attenuating said input signal when said intensity noise of said input signal is the dominant noise source.

6. The method of claim 3 further including a step of adjusting said level of attenuation such that intensity noise from said input signal is approximately equal to shot noise from said local oscillator signal.

7. The method of claim 3 further including a step of adjusting said level of attenuation such that intensity noise from said input signal is equal to the sum of all other noises related to said combined optical signal.

8. The method of claim 3 further including a step of sweeping said local oscillator signal across a range of wavelengths in order to monitor said heterodyne signal.

9. The method of claim 1 wherein said step of generating an output signal includes a step of generating said output signal in a manner that is substantially independent of the polarization state of said input signal.

10. The method of claim 1 wherein said step of attenuating said input signal includes a step of completely blocking transmission of said input signal in order to calibrate an optical coupler or an optical receiver as a function of wavelength.

11. A method for monitoring an optical signal utilizing optical heterodyne detection comprising steps of:

providing an input signal;

providing a local oscillator signal;

attenuating said input signal before said input signal and said local oscillator signal are combined;

combining said attenuated input signal with said local oscillator signal to create a combined optical signal, said combined optical signal including a heterodyne signal, intensity noise from said input signal, and shot noise;

generating an electrical signal in response to said combined optical signal;

generating an output signal from said electrical signal that is indicative of an optical parameter of said input signal; and

adjusting the level of attenuation of said attenuated input signal to maximize the signal to noise ratio of said heterodyne signal.

12. The method of claim 11 wherein said step of generating an output signal includes a step of monitoring said heterodyne signal and wherein said level of attenuation is adjusted in response to feedback from said output signal.

13. The method of claim 12 wherein said level of attenuation is adjusted such that said intensity noise from said input signal is approximately equal to said shot noise signal.

14. A system for optical heterodyne detection comprising:

an attenuator having an input to receive an input signal and having an output for outputting an attenuated input signal;

an optical coupler having a first input and a second input, said first input being optically connected to said attenuator to receive said attenuated input signal, said second input receiving a local oscillator signal, said optical coupler having an output for outputting a combined optical signal that includes said input signal and said local oscillator signal; and

an optical receiver having an input for receiving said combined optical signal from said optical coupler and an output for outputting an electrical signal representative of said combined optical signal.

15. The system of claim 14 further including a processor for receiving said electrical signal from said optical receiver and generating an output signal that is indicative of an optical parameter of said input signal, wherein said processor monitors a heterodyne signal that is a component of said combined optical signal.

16. The system of claim 15 wherein said attenuator is an adjustable attenuator that allows for variable levels of input signal attenuation.

17. The system of claim 16 further including a feedback loop between said processor and said adjustable attenuator, wherein said level of attenuation of said input signal is adjusted to maximize the signal to noise ratio of the heterodyne signal.

18. The system of claim 17 further including a second optical receiver connected to receive a portion of said input signal before said input signal is received by said optical coupler, said second optical receiver being connected to transmit a measure of the intensity noise of said input signal to said processor.

19. The system of claim 16 further including a frequency counter connected to receive a portion of said local oscillator signal before said local oscillator signal is received by said optical coupler, said frequency counter being connected to transmit a measure of the frequency of said local oscillator signal to said processor.

20. The system of claim 15 wherein said optical coupler further includes a second output for outputting a portion of said combined optical signal to said optical receiver, said optical receiver enabling said output signal to be independent of the polarization state of said input signal and balanced with regard to intensity noise of said combined optical signal.